

Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 1 096 484 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
**22.12.2004 Bulletin 2004/52**

(43) Date of publication A2:  
**02.05.2001 Bulletin 2001/18**

(21) Application number: **00309359.8**

(22) Date of filing: **24.10.2000**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(30) Priority: **25.10.1999 JP 30267599**  
**25.10.1999 JP 30267699**

(71) Applicant: **MATSUSHITA ELECTRIC INDUSTRIAL  
CO., LTD.**  
**Kadoma-shi, Osaka 571-8501 (JP)**

(72) Inventors:

- **Mizuuchi, Kiminori**  
**Neyagawa-shi, Osaka 572-0019 (JP)**
- **Yamamoto, Kazuhisa**  
**Takatsuki-shi, Osaka 569-1044 (JP)**
- **Kojima, Rie**  
**Kadoma-shi, Osaka 571-0030 (JP)**
- **Yamada, Noboru**  
**Hirakata-shi, Osaka 573-1104 (JP)**

(74) Representative: **Jeffrey, Philip Michael et al**  
**Frank B. Dehn & Co.**  
**179 Queen Victoria Street**  
**London EC4V 4EL (GB)**

(54) **Optical multilayer disk, multiwavelength light source, and optical system using them**

(57) When a wavelength of a first laser beam (23) with which a first recording medium (17) including a first recording layer is recorded and reproduced is indicated as  $\lambda_1$  (nm), a wavelength of a second laser beam (24) with which a second recording medium (18) including a second recording layer is recorded and reproduced as  $\lambda_2$  (nm), the relationship between the wavelength  $\lambda_1$  and the wavelength  $\lambda_2$  is set to be expressed by  $10 \leq |\lambda_1 - \lambda_2| \leq 120$ . The first recording layer has a light absorptance ratio of at least 1.0 with respect to the wavelength  $\lambda_1$ . The light transmittance of the first recording medium (17) with respect to the wavelength  $\lambda_2$  is set to be at least 30 in both the cases where the recording layer is in a crystal state and in an amorphous state. In order to record and reproduce the optical multilayer disk with the above-mentioned characteristics, a multiwavelength light source with the following configuration is used. Wavelengths of fundamental waves with different wavelengths from injection parts formed at one end of a plurality of optical waveguides, which satisfy phase matching conditions different from one another and are formed in the vicinity of the surface of a substrate, are converted simultaneously, and the first and second laser beams are emitted from emission parts formed at substantially the same position at the other end of the optical waveguides. This enables an optimum optical system for high density recording and reproduction to be ob-

tained.

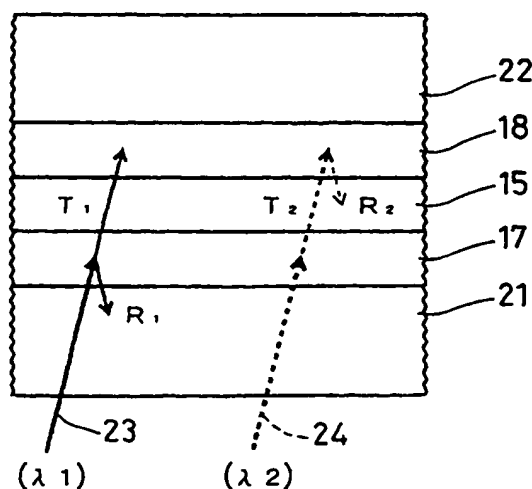


FIG. 4



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 00 30 9359

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 766 240 A (NIPPON ELECTRIC CO) 2 April 1997 (1997-04-02)	1,2,6-8, 10, 12-14,17	G11B7/24 G02B6/10 G02F1/137
Y	* column 4, line 13 - line 47; figure 2 * * column 6, line 6 - line 7 *	4,15	G02F1/37 G11B7/125 G11B7/135
X,P	EP 1 028 421 A (SONY CORP) 16 August 2000 (2000-08-16) * page 11, line 55, paragraph 154; figures 7,8 *	1,3,7, 11,12,14	G11B7/0045 G11B7/005
X,P	* page 23; example 1 * * page 24, line 9 - line 10 *	8,10	
E	EP 1 172 811 A (MATSUSHITA ELECTRIC IND CO LTD) 16 January 2002 (2002-01-16) * page 13, line 49, paragraph 61 - paragraph 112 *	9,11	
Y	EP 0 886 270 A (SONY CORP) 23 December 1998 (1998-12-23) * page 4, line 22 - line 25 *	4,15	
Y	EP 0 706 178 A (MATSUSHITA ELECTRIC IND CO LTD) 10 April 1996 (1996-04-10) * column 15, line 33 - line 36 *	4,15	G11B G02B G02F
A	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 09, 30 September 1996 (1996-09-30) & JP 08 127176 A (HITACHI LTD), 21 May 1996 (1996-05-21) * abstract *	9	
X	WO 91/12556 A (OPTISK FORSKNING INST) 22 August 1991 (1991-08-22)	18-34	
A	* page 8, line 5 - page 18, line 6; figures 2-5,13,14 *	5,16,21, 35-50	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 19 October 2004	Examiner Wahl, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 00 30 9359

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 436 757 A (HYUGA HIROAKI ET AL) 25 July 1995 (1995-07-25) * column 2, line 39 - line 58 * * column 4, line 57 - column 7, line 17 * * column 8, line 25 - line 33; figures 1-5 * * -----	5,16, 18-50	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
Munich	19 October 2004	Wahl, M	
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			



European Patent  
Office

Application Number

EP 00 30 9359

#### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

#### LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent  
Office

LACK OF UNITY OF INVENTION  
SHEET B

Application Number  
EP 00 30 9359

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4,6-15,17

High transmittance

---

2. claims: 5,16

Harmonic generation laser beam source

---

3. claims: 18-25

Phase matched common emission waveguides

---

4. claims: 26-50

Phase matching of harmonic generation waveguides

---

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 30 9359

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-10-2004

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0766240	A	02-04-1997	JP 2785763 B2	13-08-1998
			JP 9091755 A	04-04-1997
			EP 0766240 A2	02-04-1997
			US 5650992 A	22-07-1997
EP 1028421	A	16-08-2000	JP 2000235732 A	29-08-2000
			CN 1268743 A	04-10-2000
			EP 1028421 A2	16-08-2000
			ID 24789 A	16-08-2000
			KR 2000058011 A	25-09-2000
			SG 92675 A1	19-11-2002
			TW 473711 B	21-01-2002
			US 2003134229 A1	17-07-2003
			US 6511788 B1	28-01-2003
EP 1172811	A	16-01-2002	CN 1345053 A	17-04-2002
			EP 1172811 A2	16-01-2002
			JP 2003016687 A	17-01-2003
			TW 575873 B	11-02-2004
			US 2004196863 A1	07-10-2004
			US 2002024913 A1	28-02-2002
EP 0886270	A	23-12-1998	JP 11016214 A	22-01-1999
			CN 1204839 A ,B	13-01-1999
			EP 0886270 A1	23-12-1998
			ID 20471 A	24-12-1998
			US 6030678 A	29-02-2000
EP 0706178	A	10-04-1996	DE 69520920 D1	21-06-2001
			DE 69520920 T2	27-09-2001
			EP 0706178 A2	10-04-1996
			JP 8161771 A	21-06-1996
			JP 2742524 B2	22-04-1998
			JP 8212597 A	20-08-1996
			US 5876823 A	02-03-1999
JP 08127176	A	21-05-1996	NONE	
WO 9112556	A	22-08-1991	SE 468453 B	18-01-1993
			AU 7240991 A	03-09-1991
			SE 9000504 A	13-08-1991
			WO 9112556 A1	22-08-1991
US 5436757	A	25-07-1995	JP 5333395 A	17-12-1993